

CLAIM

1           1.     A dyed flame resistant fabric, comprising:  
2           a plurality of melamine fibers;  
3           wherein the flame resistant fabric has been dyed through a beam dyeing process in  
4           which the fabric has not been mechanically agitated.

1           2.     The fabric of claim 1, further comprising a plurality of non-melamine,  
2           inherently flame resistant fibers.

1           3.     The fabric of claim 2, wherein the non-melamine, inherently flame  
2           resistant fibers include aramid fibers.

1           4.     The fabric of claim 2, wherein the non-melamine, inherently flame  
2           resistant fibers are para-aramid fibers.

1           5.     The fabric of claim 2, wherein the non-melamine, inherently flame  
2           resistant fibers have been dyed through the beam dyeing process.

1           6.     The fabric of claim 2, wherein the fabric is approximately 20% to 75%  
2           melamine fibers by composition.

1           7.     The fabric of claim 2, wherein the fabric is approximately 30% to 50%  
2 melamine fibers by composition.

1           8.     The fabric of claim 2, wherein the fabric is approximately 40% melamine  
2 fibers by composition.

1           9.     The fabric of claim 1, wherein the fabric is a woven fabric.

1           10.    The fabric of claim 1, wherein the fabric has a weight of approximately 5  
2 oz/yd<sup>2</sup> to 9 oz/yd<sup>2</sup>.

1           11.    The fabric of claim 1, wherein the fabric has a weight of approximately 7.5  
2 oz/yd<sup>2</sup>.

1           12.    The fabric of claim 1, wherein the fabric has a trapezoidal tear strength of  
2 at least approximately 30 lbf. in the warp direction and at least approximately 25 lbf. in  
3 the filling direction.

1           13.    The fabric of claim 1, wherein the fabric has an L\* value no greater than  
2 approximately 60.

1           14.    The fabric of claim 1, wherein the fabric has an L\* value no greater than  
2 approximately 35.

1           15.    The fabric of claim 1, wherein the fabric has an L\* value no greater than  
2 approximately 25.

1           16.    A dyed flame resistant fabric, comprising:  
2 a plurality of dyed melamine fibers; and  
3 a plurality of aramid fibers;  
4 wherein the flame resistant fabric has been dyed through a beam dyeing process in  
5 which the fabric has not been mechanically agitated.

1           17.    The fabric of claim 16, wherein the aramid fibers comprise para-aramid  
2 fibers.

1           18.    The fabric of claim 16, wherein the aramid fibers have been dyed through  
2 the beam dyeing process.

1           19.    The fabric of claim 16, wherein the fabric is approximately 20% to 75%  
2 melamine fibers by composition.

1           20.    The fabric of claim 16, wherein the fabric is approximately 30% to 50%  
2 melamine fibers by composition.

1           21.     The fabric of claim 16, wherein the fabric is approximately 40% melamine  
2     fibers by composition.

1           22.     The fabric of claim 16, wherein the fabric has a composition of  
2     approximately 40% melamine fibers and approximately 60% para-aramid fibers.

1           23.     The fabric of claim 16, wherein the fabric is a woven fabric.

1           24.     The fabric of claim 16, wherein the fabric has a weight of approximately 5  
2     oz/yd<sup>2</sup> to 9 oz/yd<sup>2</sup>.

1           25.     The fabric of claim 16, wherein the fabric has a weight of approximately  
2     7.5 oz/yd<sup>2</sup>.

1           26.     The fabric of claim 16, wherein the fabric has a trapezoidal tear strength of  
2     at least approximately 30 lbf. in the warp direction and at least approximately 25 lbf. in  
3     the filling direction.

1           27.     The fabric of claim 16, wherein the fabric has an L\* value no greater than  
2     approximately 60.

1           28.     The fabric of claim 16, wherein the fabric has an L\* value no greater than  
2     approximately 35.

1           29.    The fabric of claim 16, wherein the fabric has an L\* value no greater than  
2   approximately 25.

1           30.    A dyed, woven flame resistant fabric suitable for use in the construction of  
2   firefighter turnout gear, comprising:

3           a plurality of dyed melamine fibers; and

4           a plurality of dyed para-aramid fibers;

5           wherein the flame resistant fabric has a composition that comprises approximately  
6   30% to 50% melamine fibers and approximately 70% to 50% para-aramid fibers;

7           wherein the melamine fibers and the para-aramid fibers have been dyed through a  
8   beam dyeing process in which the fabric has not been mechanically agitated.

1           31.    The fabric of claim 30, wherein the fabric has a composition of  
2   approximately 40% melamine fibers and approximately 60% para-aramid fibers.

1           32.    The fabric of claim 30, wherein the fabric has a weight of approximately 5  
2   oz/yd<sup>2</sup> to 9 oz/yd<sup>2</sup>.

1           33.    The fabric of claim 30, wherein the fabric has a weight of approximately  
2   7.5 oz/yd<sup>2</sup>.

1           34.     The fabric of claim 30, wherein the fabric has a trapezoidal tear strength of  
2     at least approximately 30 lbf. in the warp direction and at least approximately 25 lbf. in  
3     the filling direction.

1           35.     The fabric of claim 30, wherein the fabric has an L\* value no greater than  
2     approximately 60.

1           36.     The fabric of claim 30, wherein the fabric has an L\* value no greater than  
2     approximately 35.

1           37.     The fabric of claim 30, wherein the fabric has an L\* value no greater than  
2     approximately 25.

1           38.     A method for dyeing a melamine fabric, comprising the steps of:  
2             wrapping the melamine fabric around a perforated beam of a beam dyeing  
3     machine such that several layers of fabric surround the beam;  
4             injecting dyebath into the beam so that the dyebath penetrates the fabric layers;  
5     and  
6             circulating the dyebath through the fabric layers until the fabric is dyed to a  
7     desired shade.

1           39.     The method of claim 38, wherein the melamine fabric comprises a  
2     plurality of melamine fibers and non-melamine, inherently flame resistant fibers.

1           40.    The method of claim 39, wherein the fabric is approximately 20% to 75%  
2    melamine fibers by composition.

1           41.    The method of claim 39, wherein the fabric is approximately 30% to 50%  
2    melamine fibers by composition.

1           42.    The method of claim 39, wherein the fabric is approximately 40%  
2    melamine fibers by composition.

1           43.    The method of claim 38, wherein the step of wrapping the melamine fabric  
2    around the perforated beam comprises wrapping approximately 100 to 1250 yards of  
3    fabric around the beam.

1           44.    The method of claim 38, wherein the step of wrapping the melamine fabric  
2    around the perforated beam comprises wrapping the melamine fabric such that the fabric  
3    layers around the beam have a combined thickness of approximately 6 to 25 inches.

1           45.    The method of claim 38, wherein the step of injecting dyebath into the  
2    beam comprises injecting a neutral aqueous solution into the beam.

1           46.    The method of claim 45, wherein the dyebath comprises a disperse dye.

1           47.    The method of claim 38, wherein the step of injecting dyebath into the  
2   beam comprises injecting a lightly acidic solution into the beam.

1           48.    The method of claim 47, wherein the dyebath comprises a combination of  
2   disperse and acid dye.

1           49.    The method of claim 38, wherein the dyebath includes a dye assistant.

1           50.    The method of claim 49, wherein the dye assistant comprises one of aryl  
2   ether and benzyl alcohol.

1           51.    The method of claim 38, wherein the fabric has a weight of approximately  
2   5 oz/yd<sup>2</sup> to 9 oz/yd<sup>2</sup>.

1           52.    The method of claim 38, wherein, through the dyeing process, the fabric  
2   attains an L\* value no greater than approximately 60.

1           53.    The method of claim 38, wherein, through the dyeing process, the fabric  
2   attains an L\* value no greater than approximately 35.

1           54.    The method of claim 38, wherein, through the dyeing process, the fabric  
2   attains an L\* value no greater than approximately 25.



1 55. A melamine fabric dyed in accordance with the method of claim 38.

1 56. A method for dyeing flame resistant fabric, comprising the steps of:  
2 wrapping a flame resistant fabric comprising a plurality of melamine fibers and a  
3 plurality of aramid fibers around a perforated beam of a beam dyeing machine such that  
4 several layers of fabric surround the beam;  
5 injecting dyebath into the beam so that the dyebath penetrates the fabric layers, the  
6 dyebath comprising an aqueous solution containing a disperse dye; and  
7 circulating the dyebath through the fabric layers until the fabric is dyed to a  
8 desired shade.

1 57. The method of claim 56, wherein the fabric is approximately 20% to 75%  
2 melamine fibers by composition.

1 58. The method of claim 56, wherein the fabric is approximately 30% to 50%  
2 melamine fibers by composition.

1 59. The method of claim 56, wherein the fabric is approximately 40%  
2 melamine fibers by composition.

1 60. The method of claim 56, wherein the step of wrapping the fabric around  
2 the perforated beam comprises wrapping approximately 100 to 1250 yards of fabric  
3 around the beam.

1           61.     The method of claim 56, wherein the step of wrapping the fabric around  
2     the perforated beam comprises wrapping the melamine fabric such that the fabric layers  
3     around the beam have a combined thickness of approximately 6 to 25 inches.

1           62.     The method of claim 56, wherein the dyebath comprises a combination of  
2     disperse and acid dye.

1           63.     The method of claim 56, wherein the dyebath includes a dye assistant.

1           64.     The method of claim 63, wherein the dye assistant comprises one of aryl  
2     ether and benzyl alcohol.

1           65.     The method of claim 56, wherein the fabric has a weight of approximately  
2     5 oz/yd<sup>2</sup> to 9 oz/yd<sup>2</sup>.

1           66.     The method of claim 56, wherein, through the dyeing process, the fabric  
2     attains an L\* value no greater than approximately 60.

1           67.     The method of claim 56, wherein, through the dyeing process, the fabric  
2     attains an L\* value no greater than approximately 35.

1           68.    The method of claim 56, wherein, through the dyeing process, the fabric  
2   attains an L\* value no greater than approximately 25.

1           69.    A melamine fabric dyed in accordance with the method of claim 56.

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